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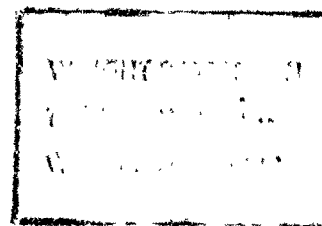
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By
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**PERSONNEL LABORATORY
AERONAUTICAL SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
LACKLAND AIR FORCE BASE, TEXAS**

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**AIR FORCE ACADEMY SELECTION VARIABLES
AS PREDICTORS OF SUCCESS IN PILOT TRAINING**

By
Lonnie D. Valentine, Jr.

Project 7717, Task 87003

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ABSTRACT

Of the first class graduating from the Air Force Academy, 172 entered Flying Training. Scores from the Academy selection tests, given five years earlier, were correlated with pass/fail criteria in Primary and Basic Flying Training, and with final grades in Basic Training. None of the College Entrance Examination Board scores were predictive of success in Flying Training. The Pilot composite of the Air Force Officer Qualifying Test had moderately high validity for passing both Primary and Basic Training. Neither of the sets of selection tests showed much discrimination for final grades of the successful students.

AIR FORCE ACADEMY SELECTION VARIABLES AS PREDICTORS
OF SUCCESS IN PILOT TRAINING*

Selection of cadets for the Air Force Academy is based in part on an extensive battery of tests. Among these are the College Entrance Examination Board achievement tests and the Air Force Officer Qualifying Test. Previous reports have shown the extent to which the various parts and composites of these batteries predict success in the Academy curriculum (Christal & Krumboltz, 1957; Creager & Miller, 1960; Miller, 1960a; Miller, 1960b; Miller & Creager, 1960).

This paper reports validities for College Entrance Examination Board (CEEB) scores and for AFOQT composite and subtest scores against Pilot Training criteria for a sample of Air Force Academy graduates. These validities are of special interest for several reasons. First, there was a four and one-half year time interval between administration of the test variables and entry of the sample into Pilot Training. These data afford an opportunity to examine the validity of individual AFOQT subtests for Pilot Training criteria; during recent years data of this sort have not been readily available, since operational scoring of the AFOQT yields composite, rather than subtest, scores. Relationships between the test variables and the various criteria employed suggest some interesting problems for further investigation.

The present sample consists of those graduates of the Air Force Academy class of 1959 for whom both Pilot Training criterion data and a complete set of CEEB and AFOQT scores were available. The sample consists of 151 graduates from Basic Pilot Training and 21 eliminees from Pilot Training. Eleven of the eliminees were eliminated during Primary Pilot Training, and the remaining ten were eliminated during Basic Pilot Training. Basic Flying and Academic grades were available for the 151 graduates, but were not available for the eliminees.

Using the total sample, Pearson product-moment correlations were computed between each of the available test scores and the following criteria:

- (1) Primary Graduation vs. Primary Flying Deficiency Eliminations
- (2) Primary Graduation vs. Total Primary Eliminations
- (3) Basic Graduation vs. All Flying Deficiency Eliminations
- (4) Basic Graduation vs. All Eliminations

These correlations are reported in Table 1.

*Manuscript released by the author for publication as an ASD Technical Note in September 1961.

Table 1. Correlation of Air Force Academy Selection Variables
with Various Pass/Fail Criteria in Pilot Training

Sample: 172 Air Force Academy Graduates in Pilot Classes 61A and 61B

Variable	r ₁	r ₂	r ₃	r ₄
CEEB Composites				
Quantitative Aptitude	.04	-.03	.00	.00
Intermediate Mathematics	-.05	-.13	-.08	-.06
High School Rank	.15	.13	.19	.14
AFOQT Composites				
Observer-Technical	.25	.20	.13	.18
Pilot	.51	.45	.38	.34
Officer Quality	-.06	-.04	-.09	-.09
AFOQT Subtests				
Reading Comprehension	-.18	-.11	-.08	.00
Vocabulary	-.08	-.03	-.14	-.12
General Knowledge	-.18	-.10	-.22	-.17
Aviation Information	.30	.30	.17	.20
General Science	.04	.12	-.08	.03
Arithmetic Reasoning	.13	.05	.04	.03
General Mathematics	-.10	-.07	-.14	-.06
Table Reading	.11	-.02	.15	.07
Aerial Landmarks	.25	.14	.23	.20
Spatial Orientation I	-.02	.02	-.02	.08
Instrument Comprehension	.46	.29	.44	.21
Aerial Orientation	.38	.28	.42	.30
Visualization of Maneuvers	.41	.45	.31	.27
Mechanical Information	.35	.31	.21	.24
Mechanical Principles	.24	.28	.14	.21
Pilot Biographical Inventory	.24	.21	.17	.18
Officer Quality Biographical Inventory	.01	.09	.01	-.03
AFOQT Interest Scores				
Flying	.29	.24	.10	.07
Technical	.25	.25	-.07	-.03
Administrative	-.03	-.04	-.06	-.01
Quantitative	.07	.13	-.02	.00
Physical Aptitude Examination	-.07	-.04	-.12	.00

r₁ criterion = Primary graduation vs. Primary Flying Deficiency
Elimination

r₂ criterion = Primary Graduation vs. Primary Elimination

r₃ criterion = Basic Graduation vs. Total Flying Deficiency
Eliminations

r₄ criterion = Basic Graduation vs. Total Eliminations

Using the 151 cases who graduated from Basic, Pearson product-moment coefficients of correlation were computed between the test variables and Basic Flying and Academic Grades. These correlations are reported in Table 2.

Using pass/fail validities and the observed elimination rates, the percentages of AFA graduates at each Pilot stanine expected to be eliminated from Primary and from Basic training were computed. These percentages are presented graphically in Figure 1.

From the data presented in Table 1 and Figure 1 it may be seen that the Pilot composite and its component subtests predict pass/fail criteria quite well. However, the Pilot composite correlates slightly negatively with Basic Flying grades as do most of the subtest components of that composite. Basic Academic grades correlate positively with such variables as the Officer Quality composite, Observer-Technical composite and the quantitative subtests.

One would expect similar patterns of correlation for test data vs. a Pass/Flying Deficiency criterion and a Flying grade criterion on the assumption that criteria used to eliminate a student for Flying Deficiency should be essentially the same as those criteria which govern Flying grade assignment. This appears not to be the case.

There could be several possible explanations for this. Different considerations may be employed in arriving at the two criteria; grades may be based, in large measure, on subjective considerations; various instructors may grade more or less liberally than others with the result that each instructor's grades rank his students only in relation to each other; some combination of these factors may operate. In any case, these discrepant correlational patterns present problems worth further investigation.

SUMMARY AND PLANS

Correlations of AF Academy selection variables with several Pass/Fail criteria, Flying grades, and Academic grades from Pilot Training are reported for a sample of 172 graduates of the Air Force Academy class of 1959. The AFOQT is found to be a reasonably good predictor of Pass/Fail criteria in Pilot Training for this sample. However, correlations between Flying grades and selection variables are not what would be expected from the Pass/Fail validities.

Table 2. Correlation of Air Force Academy Selection Variables
with Basic Pilot Training Flying and Academic Grades

Sample: 151 Air Force Academy Graduates who graduated from Basic
Pilot Training in Classes 61A and 61B

Variable	Criterion		Mean	S. D.
	Basic Flying Grade	Basic Academic Grade		
CEEBS Composites				
Quantitative Aptitude	-.18	.31	623.33	64.48
Intermediate Mathematics	-.21	.19	622.46	90.01
High School Rank	.02	.12	552.32	99.02
AFOQT Composites				
Observer-Technical	-.13	.27	605.94	82.67
Pilot	-.07	.15	597.10	102.34
Officer Quality	-.22	.31	563.65	104.76
AFOQT Subtests				
Reading Comprehension	-.13	-.20	10.39	2.94
Vocabulary	-.20	.22	32.28	9.94
General Knowledge	-.17	-.02	3.45	3.01
Aviation Information	-.12	.16	30.81	12.18
General Science	-.08	.21	17.11	7.50
Arithmetic Reasoning	-.16	.29	19.14	5.40
General Mathematics	-.06	.20	11.29	2.35
Table Reading	-.01	.19	24.79	5.69
Aerial Landmarks	.00	.13	34.17	6.55
Spatial Orientation I	.02	.03	55.28	2.83
Instrument Comprehension	-.06	.17	20.37	6.31
Aerial Orientation	-.03	.04	18.47	5.95
Visualization of Maneuvers	-.04	.19	18.68	5.46
Mechanical Information	-.02	.11	15.52	7.21
Mechanical Principles	-.15	.17	15.92	5.17
Pilot Biographical Inventory	.10	.00	56.81	10.06
Officer Quality Biographical Inventory	-.01	-.04	21.21	4.39
AFOQT Interest Scores				
Flying	-.11	.01	16.11	2.82
Technical	.08	-.02	10.73	3.57
Administrative	.09	-.03	5.65	3.66
Quantitative	.04	-.01	11.38	4.84
Physical Aptitude Examination	-.07	.00	143.59	82.81
Criteria				
Basic Flying Grade			88.46	4.70
Basic Academic Grade			86.37	4.06



Fig. 1. Expected graduation/elimination status by Pilot Stanine of AFA graduates who enter Pilot Training. Computed from Gordon's (1954) tables, using correlations and elimination rates for the 172 AFA graduates, class of 1959.

Further studies are planned to determine whether (1) this same phenomenon exists in other samples and with other procurement sources, (2) instructor assigned influences Flying grade, and (3) a different subtest weighting arrangement would result in a Pilot composite with enhanced validity for Aircrew criteria with this and other samples.

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